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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/655,942	09/05/2003	Naoya Hasegawa	9281-4591	7018

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Gustavo Siller, Jr.
Brinks Hofer Gilson & Lione
P.O. Box 10395
Chicago, IL 60610

EXAMINER	
KIM, PAUL D	

ART UNIT	PAPER NUMBER
3729	

DATE MAILED: 03/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/655,942	HASEGAWA, NAOYA	
	Examiner	Art Unit	
	Paul D. Kim	3729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *29-60* is/are pending in the application.

4a) Of the above claim(s) *37-60* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *29-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/905,330.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/5/03,9/23/04*.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is a response to the restriction requirement filed on 1/25/2006.

Response to the Election of Species

1. Applicant's election with traverse of Species A, claims 29-36 and 45-52, in the reply filed on 1/25/2006 is acknowledged. Because, however, applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Upon further review, there are still distinct inventions in the elected Species A. On the telephone interview with the applicant, examiner explained to the applicant that there are actually four distinct species in the claimed invention.

Species A, drawn to Fig. 9 for claims 29-36.

Species B, drawn to Fig. 14 for claims 37-44.

Species C, drawn to Fig. 18 for claims 45-52.

Species D, drawn to Fig. 20 for claims 53-60.

There is no generic claim.

During a telephone conversation with Mr. Curtis on 2/17/2006 a provisional election was made with traverse to prosecute the invention of Species A, claims 29-36. Affirmation of this election must be made by applicant in replying to this Office action. Claims 37-60 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: --A METHOD OF MANUFACTURING A TUNNELING MAGNETORESISTIVE ELEMENT--.

Claim Objections

4. Claim 35 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form.

There is no recitation such as "the second antiferromagnetic layer" in claim 29.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> **The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.**

6. Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase "the domain control layers are formed by sputtering vertically to the substrate" as recited in lines 2-3 renders the claim vague and indefinite. According to the claim 29, the domain control layers are formed by sputtering obliquely to the

substrate on step (e). It is unclear how the domain control layers are formed by sputtering obliquely and vertically to the substrate.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 29-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoshima et al. (US PAT. 6,556,391) in view of Tanamoto et al. (US PAT. 5,877,511).

Aoshima et al. teach a process of making a magnetoresistive effect magnetic head comprising steps of: forming a multilayer TMR element (15 as shown in Fig. 3) from a bottom to top including a process of laminating an antiferromagnetic layer, a pinned magnetic layer in which magnetization is pinned in a predetermined direction by an exchange coupling magnetic field with the antiferromagnetic layer, an insulating barrier layer, and a free magnetic layer to form a multilayer film (see col. 5,line 63 to col. 6,line 41); forming, on the multilayer film, a lift-off resist layer (5) having a notched portion formed on the lower side thereof as shown in Fig. 4B; removing both sides of the multilayer film leaving at least a portion of the multilayer film below the resist layer as shown in Fig. 4B; forming insulating layers (19A) on both sides of the multilayer film so that the multilayer film-side ends of the upper surfaces of the insulating layers are lower than both ends of the upper surface of the free magnetic layer (equivalent with the

multilayer TMR element 15) as shown in Fig. 4C; forming domain control layers (18A) on the insulating layers by sputtering to the substrate so that the domain control layers contact both ends of the free magnetic layer (equivalent with the multilayer TMR element 15), and the multilayer film-side ends of the domain control layers coincide with the both ends of the top of the multilayer film as shown in Figs. 3 and 4C; and removing the resist layer, and forming an electrode layer (11) on the multilayer film and the domain control layers as shown in Fig. 3 (see also col. 3, line 60 to col. 6, line 41).

As per claim 31 Aoshima et al. also teach that the materials for the head are deposited by sputtering one layer on top of another layer (equivalent with vertically) as shown in Fig. 4A (col. 5, lines 38-40).

As per claim 32 Aoshima et al. also teach that the domain control layers are made of a hard magnetic material (col. 4, line 64 to col. 5, line 3).

As per claim 33 Aoshima et al. also teach that each of the domain control layers comprises a laminated film of a ferromagnetic layer (18a) and a second antiferromagnetic layer (17A), the ferromagnetic layers being in contact with at least portions of both side surfaces of the free magnetic layer (equivalent with the multilayer TMR element 15) a shown in Fig. 3.

As per claim 34 Aoshima et al. also teach that each of the insulating layers comprises an antiferromagnetic insulating layer exhibiting an antiferromagnetic property, and each of the domain control layers comprises a ferromagnetic layer (col. 4, line 41 to col. 5,line 62).

As per claims 35 and 36 Aoshima et al. also teach that the antiferromagnetic insulating layer exhibiting antiferromagnetism is made of α-Fe_2O_3 (col. 4, lines 48-50).

However, Aoshima et al. fail to teach to form the domain control layers by sputtering obliquely. Tanamoto et al. teach a process of making a magnetoresistive element including a process of forming a ferromagnetic layer by oblique sputtering method in order to contact the ferromagnetic layer to portions of a tunnel barrier layer (see col. 9, lines 14-26). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify a sputtering process to form the domain control layers of Aoshima et al. by oblique sputtering method as taught by Tanamoto et al. in order to contact the ferromagnetic layer to portions of a tunnel barrier layer.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul D. Kim whose telephone number is 571-272-4565. The examiner can normally be reached on Monday-Friday between 6:00 AM to 2:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Paul D Kim
Examiner
Art Unit 3729